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ABSTRACT

The second of three articles on the ways in which people formulate their observations, this paper begins with a discussion of the assumptions underlying analytical and class-based models of cognition. The analytical approach to the measurement of cognition is found to be inappropriate because human cognition, and consequently language processing is characterized by the ability to synthesize information. Its measurement requires an instrument that can schematize both intention and orientation. The article ends by proposing a system of identification, process, and supplementation rules for language processing based on the assumptions underlying the process of synthesis. (MSE)

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Concept Formulation
Part II
Measurement of Formulation Processes

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Abstract

This article is the second one of three presenting a framework, a method, and results respectively of a study of the ways in which people formulate their observations. The starting-point of this part is a discussion of the assumptions underlying analytical and class-based models. It is shown that the analytical approach to a measurement of cognition is inappropriate. The typically human ability to cooperative actions requires an instrument accounting for synthesis, that is the schematizing process which incorporates both intention and orientation. A rule system based on the synthetic assumptions is given at the end of the article.

Western understanding of knowledge is depicted in the traditional SVO model for description of the syntax of language, which implies the following assumptions about cognitive relations

$$S \rightleftharpoons V \leftarrow O \qquad (1)$$

V denotes the predicate (that which is uttered) about something given (O). From the model it can be read that the object is governning our actions. The subject, which is associated to the predicate, denotes who or what is assigned the utterance (I. Bierschenk, 1984a). This striving towards objectification invalidates the conception of responsibility which is the meaning of the symbolic representation of the subject in human cognitive history. The cognitive foundation of the object in language, that is its binding to the subject, is thereby reduced to the tests of omens characteristic of ancient execution processes.

The hypothesis of impartial measurement of cognitive phenomena rests on the ancient distinction between subject and object (1) and builds on the assumption that knowledge of the objective world, that which is given, may be given an algorithmic form. An algorithmic processing of the typical human action

to bring about information by means of symbols (2)

would be the same as saying that the scientific process might disregard the intentional aspects, that is anything subjective must not be part of the action, least of all anything as mysterious as an agent. The subjective aspect can only be put in afterwards in connection with the interpretation and be associated to that which the measurement was about. More formally expressed, a scientific study means an analytic and a prioristic study of verbal expressions in the form of

$$V(S, O) \qquad (3)$$

relations. The principle comprises the ability of the scientist to discern and describe cognitive phenomena by a set of easily handled two-argument propositions. This conduct leads to a destructuring of the language system in such a way that it is reduced to a network of statements in predicate logic, in which the verb is the associa-

tive link between the arguments. The sentence " Psychologists study infants ", for example, will be destructured

Psychologists $\xleftarrow{A}$ study $\xrightarrow{D}$ infants (4)

This model of analysis works with classes, that is it manipulates words and expressions having certain predetermined meaning. What is predetermined in (4) is the fact that both " psychologists " and " infants " belong to the class Human and are here discerned as one who acts (Agentive) and one who is being exposed (Dative). The philosophical classification is based on normative aspects and not on ecological-realistic ones (I. Bierschenk, 1984b). This commonly accepted principle has governed, and still does, the development of measuring instruments and the resulting concept formation.

The Analytic Proposition

As a rule, a person is assumed to be able to tell about his perceptions. With the frame of reference in the analytic proposition, this means that the person can give an appropriate response in the form of a statement that can be algorithmatized. To represent binary relations (3) in predicate logic and to algorithmatize them implies not only an extensive rule-writing but also a need for the development of arithmetic procedures. The consequences of this development were that " stimulus — response " pairs could be studied with respect to intensity or magnitude and resistence towards change. The formal expression

Magnitude (X, Y) (5)

contains the propositionally derived hypothesis that a stimulus (X) stimulates the perceptual nerve system with a subjective intensity (Y). This quantity (Y) may concern colour, tone, smell, and many other sensory impressions. From a cognitive science point of view, the important derivation is the abstraction hypothesis, which may be formulated such as

Hypothesis 1. A person is able to abstract and thereby test whether both stimulus X and stimulus X' have the magnitude Y.

Formally, similarity is tested across all or some properties:

$$\text{Similarity } (Y, Y') \qquad (6)$$

The testing requires a quantitative statement whether Y is similar to Y'. Consequently, most natural for the development of a theory of measurement founded on analytical propositions is that the measurement theorist concentrates his efforts on a study of the ability of the person to assess properties of mutually independent objects. A complete testing of the expression (6) of course requires a time notation and a test instruction.

The test instruction tells a set of experimental subjects the way in which they shall approach a specified property dimension of a certain object. If an experimental subject in a frame analysis shall make observations about the colour of a physically existing point (Lorenz, 1941; Becker, 1973), this implies at the same time that the observation is made at a given point in time (t). If the person states that the point is red, this relationship may be formulated in the following propositional statement

$$(t, \text{red(point)}) \qquad (7)$$

The measurability of a cognitive phenomenon will by that be bound solely to the person's ability to assess a property dimension, which leads to the generalization

$$(t, p(X)) \qquad (8)$$

This very primitive test methodology represents nothing else but the omen test for finding out the will of the gods (Jaynes, 1976). The bluntness of the method is not reduced either by properties expressed in single words being reformulated into phrases or sentences. The magnitude on some response parameter is traditionally represented as a set of $p(X)$ in two-dimensional matrices of the $N \times p$ type, where N = experimental subjects and p = attitudinal propositions.

Unrestricted and restricted response

The circumstance that natural language without challenge is our primary means for giving expression to our thinking, actions, and opinions is due to its unrestricted format. Verbal materials in

which persons' responses are present in a free format may concern questions and statements with open response alternatives. It may concern utterances about observations in group situations, projective materials or utterances in autobiographies and interviews. Measuring methodologists (Horst, 1966, p 268) regard these materials as inappropriate for psychological measurement and argue uncompromisingly in favour of an a priori grading of verbal expressions. Grading prerequires a formatting in which the conceptual structure and syntactic function of the utterance are not taken into account, but rather are treated as if it concerned a stimulus element, a " quantum of language ". By the formatting the response reactions of the person are bound classificationally and elementwise, which produces class-based measuring values (a_{ijh}), where i = person, j = property are available matrix entries whereas h = stimulus object is not directly available.

The methods which have been developed in contrast to formatting build on a classification of a verbal utterance with respect to its richness of ideas, content or semantic aspect, or its grammatical form. The procedures have gotten designations such as analysis of " thinking-aloud-protocols " or analysis of interview text. Other names are text analysis, document analysis, information analysis, linguistic analysis and content analysis. These and other designations accentuate different main points in the procedures but they all presuppose derived classificational systems.

Class-based Procedures

A fundamental characteristics within the class-based measuring methods whether they are formatly bound or not, is that they are partly object governed, partly completely passive (static) in their " divinity ". The measuring problem in both cases consists in finding procedures by means of which an object's properties can be predicted. The characteristics of such normatively obtained results are summarized in Figure 1. Background information to this Figure is to be found in Dörner & Kreutzig (1983) as well as in Frederiksen (1984).

In Figure 1, restricted and unrestricted response alternatives

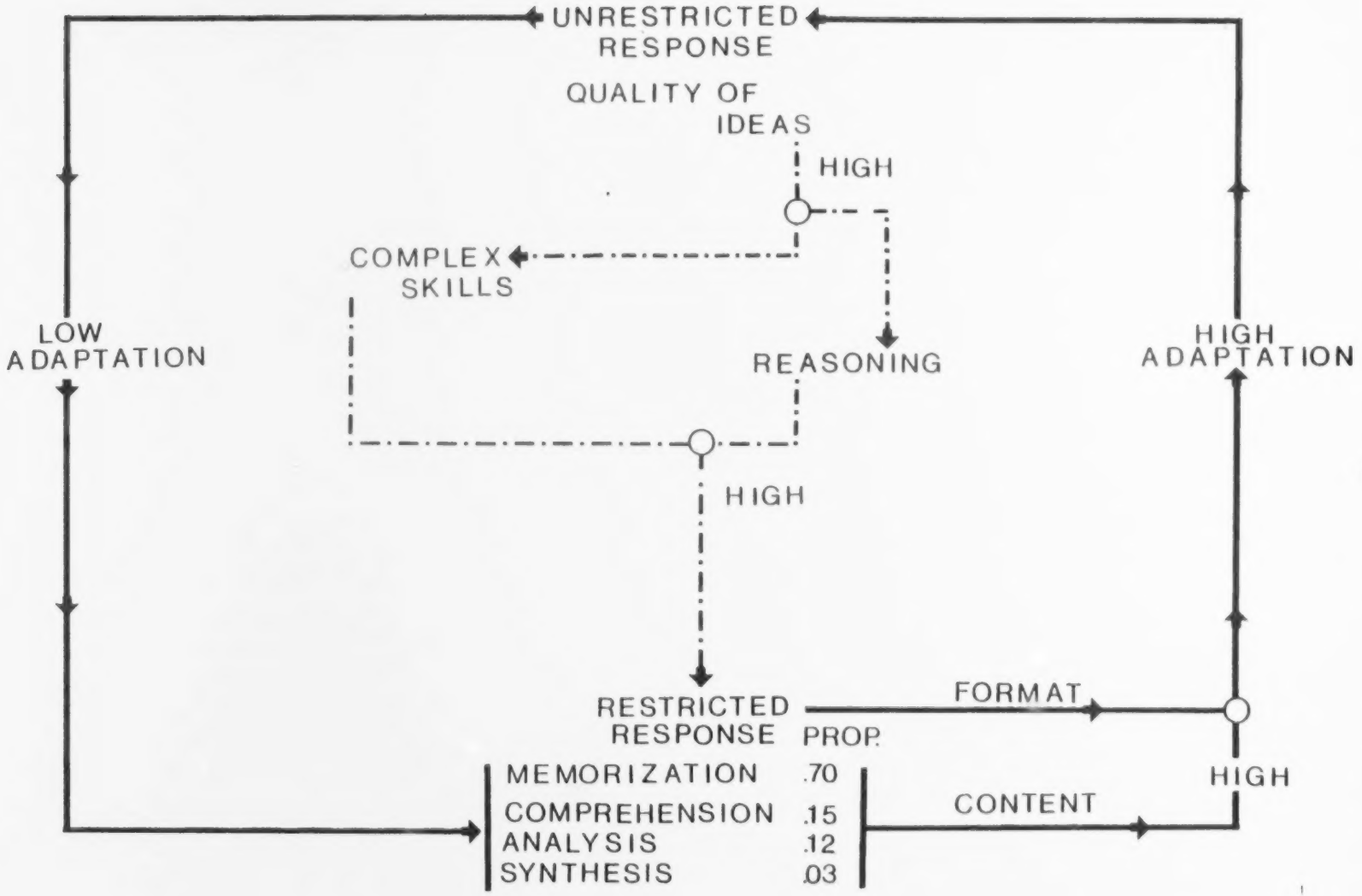

Figure 1. Correlational relations between type of response and cognitive performance

are contrasted. It shows that complex skills which have been tested in realistic situations have low correlation with a procedure that presupposes restricted response alternatives. The same relationship holds for the ability of reasoning. Frederiksen's (1984) own studies point at the existence of an asyncronic relationship in the efforts of the testing methodologist to transform unrestricted responses onto restricted ones in that both correlate low with each other. In the reverse case, to express facts in an unrestricted format, the correlation namely gives expression to a good adjustment. The high correlation between format and content is usually interpreted such that the format does not influence the measurement of the concept to be measured by the test. That this result only concerns test responses is clear from the directed arrow at the right side of the Figure. But this is the case only when multiple choice tests are adjusted to an unrestricted format. The situation is the reverse when quality and number of ideas measured with an unrestricted format is transformed to a restricted one (= multiple choice). Frederiksen (1984, p 198) reports for this case correlations of about zero (r = .18).

Despite low correlations between the two procedures there is a unifying base assumption. In both experiments, verbal utterances are conceived as primitives which can be classified in correspondence with a number of alternative a priori determined classes. The alternatives are combined and transformed in different ways so that the final result is an " impartial " measurement of human cognitive ability.

The Synthetic Proposition

If we are able to perceive objects in motion as entities, it must be due to a synthesizing process. The presupposition of this statement is an organism/formalism that makes possible a manipulation of both intention and orientation. Propositions (3) are formally regarded as structural definitions of a sentence or part of a sentence. A sentence consists of at least two parts, a subject and a predicate. Both are associated through a copula, usually " is ". Intentions are regarded as the connotation of the proposition, that is as an instruction to the language user on how a certain particu-

lar term should be used. Orientation, on the contrary, occurs through denotations, which implies that the term is used in accordance with established syntactic rules.

Expressed in cognitive science concepts, intention means the characteristics of a purposively acting organism. The intention is connotated and the behaviour (orientation) of the organism is expressed as denotated proposition. The ability to synthesize the connotation of the proposition in the form of the predicate may be given the following expression:

$$\{[\text{int}\ (A)]\ a\ [\text{ort}\ (O)]\} \qquad (9)$$

The first bracketed expression denotes that intention (int) operates which is necessary for an organism (A) through cooperative actions (a) to not only become adaptive but also to become conscious about itself. Any motion that can be ritualized into an expression is regarded as an indication of intention. The second bracketed expression indicates the importance of being able to orient (ort) towards an objective (O).

In Kant's (1724–1804) thinking, the core is the synthetic a prioristic study of verbal behaviour. According to him, an analytic a priori proposition is present when the predicate is <u>not</u> contained in the subject. His sentence often cited

A triangle is a three-sided figure (10)

is, according to this criterion, analytic, since " triangle " can be exchanged with " a three-sided figure " each time they occur together. Kant made clear that the connotations of the predicate which are contained in those of the subject lead to synthetic propositions. If this statement of Kant's is transformed into cognitive science concepts, it means that the world can be known with the starting-point in synthesis. The smallest common denominator in this process is the asymmetric relation between A(agent) and O(objective) of its action, that is agent and objective are contained in the same organism (B. Bierschenk, 1984).

The conception of language in terms of an intentional act implies the a priori existence of an operational space in language within which an " I " can orient and discern the consequences of

alternative actions. The difficulty of keeping apart intention from orientation seems to depend on the fact that every meaningful language intertwines them. A person's cooperation with its environment requires the ability to express both intention and orientation verbally. Consciousness and responsible observation are the foundations of the language mechanism that freed people from extern (the gods') steering and control (Jaynes, 1976, p 287). The development of the syntax of language has involved that an observation could be represented not only as the result of an action, as for example to throw a dice, but also that actions could be kept separate from their observations (Jaynes, 1976, p 237). This newborn freedom for people to be able to act as " autonomous observers " (B. Bierschenk, 1984) signifies the ability to verbally represent different events in a time perspective, and above all, the ability to synthesize and to take responsibility.

Texture and Structure

The traditional opinion nowadays, emanating from Chomsky, is that the linguistic " categories " in the SVO model are innate, which is Chomsky's misinterpretation of Wilhelm von Humboldt's (1767-1835) language theory. A consequence of this is that the linguistic synthesis of a verbal expression is its structural description. Despite persistent efforts, psycholinguists and language psychologists have not been capable of showing that variations in the syntactic organization have any structural, that is cognitive relevance (Broadbent, 1977; Greene, 1977). This is not surprising when one bears in mind that the " categories " are, in fact, classes, which are always artificial. It is therefore not an overstatement to say that the chomskyan era has contributed to a shallowing of the structure concept, and that this understanding has even become more intensified through AI contributions to computerized language- and text processing.

Within AI, symbols are defined with strings of alpha-numeric characters. Combined with the common, unreflected opinion that language is nothing but a convention, this definition has led the media business to specialize language professionalism in terms of text editing with the conviction that the new technique will make

information giving more efficient. But information cannot be tied to recognition and interpretation of discrete textual states. Information requires complementary dynamic processes to operate in that pieces in a texture (e.g., a phrase) are allowed to function in a perspectively varied way. In the communication of phenomena, language functions as a medium which gives to the phenomena a different texture depending on the particular producer. But several text producers may develop similar structures. Modern developments within the text processing area have erased the perspective difference between sign and symbol. The main goal of text linguists is to find the thread (Grimes, 1975) defining the textures. It easily happens within this branch of linguistics that the discussion concerns associative linking and formatting matters of the kind that are being developed by the text processing industry.

Componential Linkage

Linguistic models of language, as well as most of the other models used in the humanities and social science research, are based on an analytic a posteriori procedure with which language elements are associated to classes. This adjustment may be made more or less bound to a grammatical model. The farther away from the texture the dynamic operations run, the more implicit the grammar becomes. The researcher ought to be aware of when he employs a linguistic model and when not in his text analysis.

When an analytic a posteriori analysis is performed with the aim to compare language expressions with economic theory, for example, the analysis cannot at once be called linguistic when the connectivity builds on terms belonging to cooperations policy, market analysis or customer psychology. It is just as inadequate to speak in terms derived from a social science model when referring to the linguistic models. Because, what gives a text its determination depends on how the components of the models are assumed to operate. Consequently, text determination implies an analysis " through " language and not " by " language. In a synthetic a posteriori analysis the linkage between the components plays a central role while grammatical form is of subordinate importance. Unfortunately, the textual coordination (dependencies) that the syntax develops is not used in

any controlled fashion.

The way in which information in natural texts ought to be represented should be studied with the point of departure in a synthetic a priori analysis. Through such an approach only, it becomes possible to study the capability of language to reflect intentionality and orientation.The premises for an investigation of what is significant to a realistic agent govern the following hypotheses:

Hypothesis 2. Natural language is precise and conceptually complete when used in a natural context.

Hypothesis 3. A person has the ability to use natural language at an unambiguous formulation of his observations.

Hypothesis 4. Different persons' ability to information pick up and sensitivity to the function of concepts in natural contexts is reflected in an adaptive language usage.

Finding suitable procedures for a crystallization of the language components so as to be able to study the informational structure in both information tight and information loose texts is the main goal of the methodological approach presented in this article. It differs in considerable respects from traditional approaches. For sure, it considers the distinction between subject and object but is also brings out the complementarity of both, that is objectivity is made dependent of subjectivity. It presupposes not only that a method can be developed which associates the various properties an object may take. It further requires that a procedure can operate and catch the perspectives from which a given object can be viewed. The particularly new in this approach is that it is synthetic a prioristic with respect to the dynamics of natural language in operation. By the linkage of the components of language its syntactic mechanism is created and interpreted. In that this mechanism must be regarded as a product of the inherent dynamics of language (Pattee, 1977), this can be known only by discovery. It has not been invented. This double mechanism of change exists in language and ought to be the

starting-point for all kind of methodological development concerning verbal material.

The Double Change Mechanism of Language

To be able to study the manifestation of cognitive phenomena in natural language we need a model which can give expression to coordinative structuring. Human actions are intentional (9) and as such they are directed towards both concrete and abstract objects. The intentional basis of the formula (9) connects the Agent with the Objective in such a way that the Objective is explicated only with the agent as point of reference. The connecting function is brought about by the action component. The linkage of the components is cooperative and may be expressed with the paradigm

$$A \rightarrow a \rightarrow O \qquad (11)$$

which denotes a synergetic relation within a three-component system. The relations between the components define the coordinative function of a clause system. A dynamic description of how verbal expressions cooperate requires that the dynamic linkage can be defined through the functional affinity between Agent and Objective specified by the action. A synthetic a priori analysis begins with the formula

$$\emptyset \quad \text{action} \quad \emptyset \qquad (12)$$

where $\emptyset$ denotes placeholders and poses the questions: What is agent? and Towards what is the action directed? The action is approximately represented by a verb, which implies that, for example, " is " in a natural language context represents an action from the perspective of the producer of this utterance:

The researchers are positivists (13)

Consequently, " is " cannot be analyzed as a connector (10) associating a subject part with a predicate part but must be analyzed according to the synthetic definition (9). When a verbal expression is conceived as synthesis a strict dependency emerges between the coordinative cooperation of the syntactic component

$$A \rightarrow a \rightarrow (A \rightarrow a \rightarrow O) \qquad (14)$$

and the construction process through which the text gets its structure. Coordinative structuring may then be defined as a synthetic a posteriori analysis, that is an analysis of the componential linkage.

The linking process is summarized on the analytical level chosen by means of a number of natural groups (clusters) which are sufficiently organized to give expression to the individuality of the text (Bierschenk & Bierschenk, 1985). The double change mechanism of language thus means that new linguistic forms of organization and behaviour may occur during the construction process which were not predictable from previous forms.

AaO as Steering Mechanism

A dynamic description of the way in which verbal expressions are coordinated requires a procedure which takes into account discontinuity and change in the verbal behaviour. AaO used as the steering mechanism constructs perspective information from the organizationally bound information.

The basic requirement for a procedure to operate is the definition of the organizational unit. We are here working with text in its graphical form, and the organizational unit can therefore be specified to graphical sentence, which is demarcated with a punctuation mark. The graphical sentence may consist of one or several clauses, demarcated through a " clause opener " (relative pronoun and the like) and called graphical clause. This clause has an independent depth of analysis only if it takes up structural information. The structural unit, the AaO mechanism becoming visible by the presence of a verb, is called conceptual clause. What is particularly new with the conceptual clause as the highest depth of analysis is that more than one can be discovered within the frame of a graphical clause provided that the verb is defined in a wide sense. (Criteria: inflected forms; auxiliaries are verbs.) The mechanism detects an underlying clause and marks with a general clause opener and placeholders for absent A's and O's that structural information can be extracted where it is grammatically hidden. Further, the mechanism detects graphical demarcations which are not conceptu-

ally motivated.

The structurally defined information is searched for with reference in the verb inflection. In principle, the Agent is looked for in the position before an active verb and the Objective after, while the reverse procedure holds for the passive verb. Within the O-component a differentiation is made between directed and non-directed information. The non-directed appears in the Agent's perspective or figuration, whereas the directed information denotes the ground on which the figuration rests or the purpose with which it is presented (I. Bierschenk, 1984b). Except this Figure — Ground relationship there is also an inbuilt conceptual direction pointing at Means, which shall be seen as a perspective instrument. Finally, there is an indication of direction pointing at the kind of information that refers to conditions lying beyond the organism's immediate horizon. For this reason, this indication has been given the name of Setpoint.

Language contains keys that point out the Grounds, Means, and Setpoints, namely the prepositions of the type 'in', 'with', and 'for' respectively. The prepositions function intentionally and have a demarcating or specifying function. Thus information is marked conceptually through a hierarchization process, which is to be seen in a priority order among the prepositions (see the rule system).

An important part in the analysis is the supplementation mechanism, which picks up conceptual information from certain positions and inserts it at its corresponding placeholder. Placeholders to be supplemented are those which have marked the empty place for absent A- or O-information, or the general pronoun 'it' (Sw. 'det'), which transfers information explicitly. This pick-up procedure goes on differently for these types of placeholders. In an active clause, the placeholder for Objective is replaced with the immediately following clause, while the placeholder for Agent is replaced with the immediately preceding Agent. In a passive clause, the Objective information is picked up from the immediately preceding clause, while the Agent is a priori defined. The supplements of 'it' are always taken from the immediately preceding clause, but in this case the Agent is supplemented with the whole clause and the Objective with

the Objective information.

Information Carriers

For a systematic processing of text of various length one needs a transfer of the immediate information in the verbal expressions onto a symbolic system which carries the information on during different processing stages, where the text is no longer the immediate base. In this analysis a " scale " with the figure combination 00-90 is used. One advantage of this system compared with some arbitrary one is that it picks up the complementary dimensions of language, intention and orientation. The cooperation between both is namely expressed through the hierarchy reflected in the functional order of the intention (the tens) and the syntactically bound order of the orientation (the units). The symbol 50 stands for a component of a certain kind (5.) and also its most general information (.0), while 51 denotes some kind of demarcation within the same component. In one and the same clause, an orienting information cannot be present without a denotation of intention.

The components presented have the following positions on the scale. The main components are coded: Agent (30), action (verb) (40), Figure (50), Ground (60), Means (70), and Setpoint (80). The conceptual schema is complete when 30 and 40 plus at least one of the others are present.

The code for graphical sentence boundary is (00). Its principle importance in the system lies in the necessity of marking the beginning and the end. If the end of a sentence does not at the same time mark the beginning of a new, the system discerns an end of text (90). Between beginning and end the clause openers (01, ...) mark the demarcations within which the AaO relations are discerned. This process starts at the end of the sentence and must get a signal through a clause opener at the top of the sentence which marks the upper boundary. The beginning of the sentence is thus defined with (00 01), a double intentional code for " boundary ". It means at the same time that a sentence boundary can be found within the graphical sentence by at least two clause openers following each other (..., (01) why (01)...).

A very important component that the entire analysis system has to distinguish is the agent from which the verbal flow originates. This so called " outer agent " must be a priori established, for example, by defining it with the variable (X). This X-variable is the prerequisite for the paradigmatic operation of the text to be separated from its syntactic (14). Some Y-variable, which is the prerequisite for identifying a text on the whole (the manifestation of the O-component), needs not be a priori defined. In certain text production situations, however, a Y-variable is present with the function of constituting a point of reference for the agent.

There are two components in the scheme which are tied to the X-variable. Both means a denotation of conditions under which the a priori defined Agent is present, one as Context (10) and the other as Experience (20). Quite naturally, these components are bound to the beginning of the text, which implies that they may appear at the beginning of every sentence, Experience by a clause opener and Context by a preposition. What they both have in common is that they are substitutes for the a priori Agent syntactically but initiates the procedure that picks up the Agent from its conceptual depth.

In this connection we especially want to point at the asymmetrical functioning of the system. The differentiating function of the prepositions by the establishing of the Objective component is nullified when a preposition is bound to the Agent component. They point to Context in the sense of background to the X-variable or demarcate the Agent when they are produced between 30 and 40. Thereby the information should be regarded as integrated and no longer available for processing.

Rule System

Before reading in a text for analysis, instructions should be given on how the textual data shall be discerned. The unit of this analysis is determined to be the graphical word. The term refers to the alphabetic or numeric characters between two spaces. A graphical word also includes numbers with decimals. Junctural graphemes, which are only identified by right-sided space, have in this analysis the function of a graphical word. It is convenient to mark them with a

left-sided space too, for the sake of clearness. The assignment of the codes to the graphical words may be done according to a fixed or a floating format. The fixed one has the advantage of giving a better overview over the various steps in the analysis, but is, of course, less flexible.

The analysis builds on five registers: sentence openers, clause openers, prepositions, stopwords, and verbs. A set of 50 rules operates on the text. In the following, the rules will be presented.

Identification Rules

Rule 1 Identify the next following sentence opener.
Operation: Assign to the first one of two sentence openers code 00.

Rule 2 Define the beginning of a sentence with sentence opener [.]
Operation: Equate the sentence opener with a sentence boundary.

Rule 3 Identify the strings within two sentence boundaries or sentence boundary and the end of text with graphical sentence.
Operation: Get the sentence for processing.

Rule 4 Identify clause openers.
Operation: Assign code 01.

Rule 5 A clause opener does not follow immediately after a sentence opener.
Operation: Insert [that] (Sw.'att') immediately after the sentence opener.
Assign code 01.

Rule 6 A clause opener follows immediately after a clause opener.
Operation: Assign to the first of two clause openers code 00.

Rule 7 Identify prepositions.
Operation: Assign to the prepositions codes (60, 70, 80)

Rule 8 Equate the second, third, etc. with the intentional code of the first preposition.
Operation: Assign to the second, third, etc. the code of the first preposition.

Rule 9 Equate a sentence boundary with the end of text.
Operation: Assign code 90.

Rule 10 Identify verbs.
Operation: Assign code 40.

Rule 11 A preposition opens an unidentified string before the verb.
Operation: Assign to the unidentified string code 10.

Rule 12 Identify a new graphical sentence.
Operation: Get the sentence for processing

Rule 15 At least two verbs are enclosed within the end of sentence and a clause opener or two clause openers.
Operation: Rank order [verb (1), verb (2)]

Rule 16 A verbless string is enclosed within the end of sentence and a clause opener or two clause openers.
Operation: Assign to an unidentified string code 01.

Process Rules

Rule 18 Identify the verb with active (a)
Operation: Assign to the verb code a

Rule 19 Unidentified string follows immediately after the verb.
Operation: Assign code 50.

Rule 20 Unidentified string follows immediately after a preposition.
Operation: Assign the code of the preposition.

Rule 21 Differentiate between verb (1) and verb (2) by [that]
Operation: Insert [that] immediately before the second of the two last verbs.
Assign to [that] code 01.
Remove rank ordering.

Rule 22 The verb is the last string before the end of sentence or a clause opener.
Operation: Insert the symbol Aa [ø] after the verb.
Assign to the Aa [ø] code 50.

Rule 23 The preposition is subordinated to the component.
Operation: Assign to the subordinated preposition the orientation code (.3, .4, ...)

Rule 24 Unidentified string does not follow immediately after a preposition

Operation: Insert the symbol Aa [ø] after the preposition.
Assign to the Aa [ø] the intentional code of the preposition.

Rule 25 A clause opener precedes a verbless string.
Operation: Assign to the clause opener the code of the component.

Rule 27 A verbless string without preposition follows immediately after a component.
Operation: Assign to the 01-string the code of the component.

Rule 28 A preposition opens a verbless string.
Operation: Assign to the 01-string the intentional code of the preposition.

Rule 30 A component consists of several strings.
Operation: Assign to the last string of the component the orientation code (.0)
Order the other strings so that the immediately preceding string gets (.2) and the following string/s (.1).
Assign a stopword to the immediately following string.

Rule 31 An unidentified string precedes an a-verb.
Operation: Assign to the unidentified string code 30.

Rule 33 An unidentified string does not precede an a-verb.
Operation: Insert the symbol [ø] a0 immediately before the verb
Assign to the [ø] a0 code 30.

Rule 34 A verbless string precedes an Agent-string.
Operation: Assign to the verbless string code 30.

Rule 41 Identify the verb with passive (p).
Operation: Assign to the verb code p.

Rule 42 An Agent is absent.
Operation: Mark with the symbol [ø] a0 immediately after the p-verb.
Assign to the [ø] a0 code 30.

Rule 43 An unidentified string precedes a p-verb.
Operation: Assign to the unidentified string code 50.

Rule 45 An unidentified string does not precede a p-verb
An Objective is absent.
Operation: Mark with the symbol Aa [Ø] immediately before the p-verb.
Assign to the Aa [Ø] code 50

Supplementation Rules

Rule 48 Identify the conceptualization with (40 p) with P-block.
Operation: Number in sequential order

Rule 49 An Aa [Ø] within a P-block follows immediately after a Preposition.
Operation: Supplement with the reference number of the immediately preceding block.

Rule 50 [Ø] aO appears within a P-block.
Operation: Supplement with an a priori defined Agent or the variable (X).

Rule 51 'it' (Sw. 'det') is a single string within the Agent component of an A-block.
Operation: Supplement with the reference number of the immediately preceding block.
If no reference exists, then supplement with the variable (X).

Rule 52 'it' is a single 50-string within a P-block.
Operation: Supplement with the reference number of the immediately preceding block.

Rule 53 'it' is a single string within the Objective component of an A-block.
Operation: Supplement with the reference number of the immediately preceding block plus code 50, 60, 70, or 80 in this order.

Rule 54 An Aa [Ø] is followed by a clause opener within an A-block.
Operation: Supplement with the reference number of the immediately following block.

Rule 55 An Aa [Ø] is followed by end of sentence within an A-block.

Operation: Supplement with the immediately following 01-string or with the reference number of the immediately following block.

Rule 56 An Aa [Ø] follows after a clause opener within a P-block.
Operation: Supplement with the reference number of the immediately preceding block.

Rule 57 A verbless string appears within two clause openers before a [Ø] aO.
Operation: Supplement the [Ø] aO with the verbless string.

Rule 58 A [Ø] aO opens a sentence.
Operation: Supplement with an a priori defined Agent or the variable (X).

Rule 59 A [Ø] aO opens a clause.
Operation: Supplement with the reference number of the immediately preceding block plus code 30.

Rule 60 Identify the conceptualization with (40 a) with A-block.
Operation: Number in sequential order.

Rule 63 Integrate the reference numbers.
Operation: Balance the Objective component starting from the end of text.
Balance the Agent component starting from the beginning of text.

Rule 64 Replace the reference numbers with graphical strings.
Operation: Replace a 40-string with a + character
Delete identical strings within parantheses marking supplementations.

Rule 65 Differentiate (X) by adding a 10-string.
Operation: Combine (X) with the 10-string

Rule 66 A 10-string opens a clause before a [Ø] aO.
Operation: Supplement with an a priori defined Agent or the variable (X).

Rule 67 Differentiate (X) by adding a clause opener.
Operation: Assign to the clause opener code 20
Combine (X) with the 20-string and the preceding string.

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